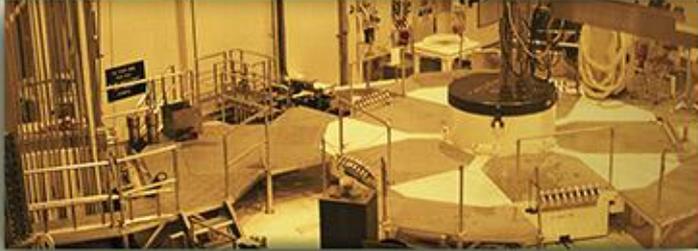




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Extended Storage: Research Perspective



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Guiding Principles

- Disposal or reprocessing not likely for decades
- Current regulations: up to 120 years combined wet/dry
 - 60 years wet storage; 60 years dry storage
- Global interest: Not just a U.S. issue
- Storage systems will have to perform intended function beyond current licensing period

**Technical bases for dry storage >60
years not yet demonstrated**

Functions of Dry Cask Storage Systems

- Thermal performance
- Radiological protection
- Confinement
- Sub-criticality
- Retrievability



Can existing and future dry casks maintain these functions for decades?

Temperature-related Dry Storage System Degradation Mechanisms

- Fuel cladding creep caused by increased cladding ductility and increased stress
 - Due to higher temperatures causing higher pressures inside the cladding
- Hydride reorientation in the spent fuel cladding
- Corrosion
- Degradation of neutron shielding
- Concrete dry-out and cracking

Changes as the System gets Older and Cooler

- Mostly good things
 - Reduced metal creep rates
 - Reduced corrosion rates
 - Reduced gamma and neutron radiation
- Potential negatives (mostly related to cladding)
 - Additional hydride precipitation
 - Decreased cladding ductility
 - *Potentially* more susceptible to breakage during storage and transportation

Aging Management R&D Needs

- Near-term: Maximize life of existing systems and ensure transportability
 - Additional data and analyses of long-term degradation mechanisms
 - Enhanced monitoring and inspection
- Intermediate-term: Evaluate mitigation/design options
 - E.g., anti-corrosion coatings, new cask designs
- “Eventually” (more costly, higher worker dose)
 - Canning
 - Repackaging
 - Over-packaging
 - Use risk-informed approach to decision making

When is “eventually”?

EPRI Extended Storage Collaboration Program

- Purpose: Provide the technical bases to ensure safe, long-term used fuel storage and future transportability.
- Modeled on prior dry storage license extension research
- Participants: EPRI, NRC, DOE, NEI, utilities, vendors, international
- Phased approach
 - Phase 1: Review current technical bases and conduct gap analysis for storage systems
 - Phase 2: Conduct experiments, field studies, and additional analyses to address gaps
 - Phase 3: Coordinate research that results in a demonstration of a licensed dry storage system loaded with high burnup fuel (>45 GWd/MTHM)

Together...Shaping the Future of Electricity